

AIRSHIPS

TRANSATLANTIC TRANSPORTATION



U. S. NAVAL
AIR STATION
LAKEHURST, N. J.

SUMMER

1936

25c

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of

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BROOKLYN

NEW YORK

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to extend a warm welcome to
the officers, passengers and
crew of the Hindenburg on this
historic occasion.*

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FOREWORD

The United States Cooperates

Scheduled commercial air transportation service over the North Atlantic is being demonstrated for the first time by the newest German airship, *HINDENBURG*, in 1936 through the assistance of the United States. Formal application for this American cooperation was made by Dr. Hugo Eckener late in 1934 when the *HINDENBURG* was about three-quarters completed and plans for such transoceanic aerial service were projected.

Dr. Eckener's application contained generous expression of appreciation for the cooperation which had been extended in the past when the now famous *GRAF ZEPPELIN* visited this country, and requested permission to demonstrate an airship service for passengers, mail and freight, between Europe and the United States, provided arrangements could be made to use temporarily certain Government controlled airship facilities which were not in active service. No suitable privately owned airship facilities exist in the United States.

Since a demonstration of the utility of an airship service across the North Atlantic was clearly in the public interest and involved no liability or financial outlay on the part of the Government, this proposition found favor. Ample authority and precedent existed for allowing private operators to use Government controlled aeronautical facilities under prescribed conditions.

Accordingly, following precedent, a revocable permit was drawn up whereby the operators of the *HINDENBURG*, namely, the *Luftschiffbau-Zeppelin, G.m.b.H.*, of Friedrichshafen, Germany, and its affiliate the *Deutsche Zeppelin Reederei, G.m.b.H.*, of Berlin, are granted permission to use certain facilities at the Naval Air Station, Lakehurst, New Jersey (and at Miami, Florida) under specified conditions. These conditions are founded on the general promise that use of the facilities shall be at the risk of the Permittee and shall be without any expense or responsibility on the part of the United States. Fees are to be paid for the use of the airship shed and other equipment.

The detailed arrangements worked out in cooperation with various Government agencies include, amongst other things, provision for the handling of mails under the existing International Postal Agreements, and coordination with proper agencies such as customs, immigration and others for entering and clearing a foreign flag airship carrying passengers, mail and a freight cargo.

As owner of the only suitable airship terminal facilities, the Navy Department has naturally played a prominent part in the arrangements. Furthermore, this is also logically in line with the Navy's obligation to the country as regards lighter-than-air craft which is expressed in current Naval Policy as—

"To build and operate rigid airships as necessary to determine their usefulness for naval and other governmental purposes and their commercial value."

Thus, while the operations of the *HINDENBURG* are entirely commercial and involve no responsibility or expense on the part of the Government, the United States is showing its interest in airship transportation by assisting in these *HINDENBURG* flights through the leasing of its Lakehurst facilities.

SOUVENIR BOOK

AIRSHIPS

Transatlantic Transportation

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Summer 1936
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The articles presented herein have been prepared by various Naval officers experienced in airships. The opinions or assertions therein are the private ones of the writers and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

The profits from the sale of this pamphlet are for the benefit of the Navy Relief Society which is a charitable organization devoted entirely to rendering assistance to needy cases connected with the Naval Service.

HARRY HOUSTON
Editor

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The Shenandoah

EARLY in March 1936, there appeared in the skies at Friedrichshafen, Germany, for the first time, the latest and greatest of a renowned family of airships. Assigned the builders' number of LZ-129, this aerial merchantman is actually the 118th of the Zeppelin type built in Germany, other numbers in the series having been assigned to ships laid down on paper but never built. Altogether there have been built and flown in the entire world but 157 rigid airships; of these, 16 were British, 3 American and the remainder German, 20 of the latter being of the Schütte-Lanz type. Of the 157 total rigid airships, only 14 have been commercial, 7 of these were pre-war Zeppelins, 2 were British and 5 were post-war Zeppelins. Hence, representing only the 12th commercial Zeppelin, the magnificent HINDENBURG indeed stands for most creditable progress.

Grade as they would now appear to us, their hulls merely cylindrical bodies finished off with odd tapered ends, pre-war Zeppelins nevertheless carried thousands of passengers in safe, successful air transportation. Dear to the hearts of those early pioneers are such airship names as "DEUTSCHLAND", "SCHWABEN", "VIKTORIA-LUISE", "HANSA" and "SACHSEN". Each successive ship incorporated lessons and improvements derived through the pangs of pioneering.

Then came the World War with all commercial thoughts shoved deep into the background. Early 1917 saw the passing of old Count Zeppelin whose basic wish for the aerial giants bearing his name had always been the establishment of world-wide aerial transport. But the Count's ideas had been deeply planted in Dr. Hugo Eckener and the others remaining to carry on the work.

Within a year after the end of the World War practically from left over material, the Germans fashioned the BODENSEE and the NORDSTERN, two small commercial airships each less than half the size of our LOS ANGELES. Both were soon demanded by the Allies, one going to France and the other to Italy. Both soon went into oblivious dismantlement although really excellent ships for their size. The NORDSTERN did not have time to get into commercial service before being taken from Germany. The BODENSEE however, in her brief operation of 98 days by her builders, made 103 trips, 78 being between Friedrichshafen and Berlin and carried 2253 passengers as well as considerable mail and freight, before her promising career came to an artificial end.

Allied restrictions then for several years imposed such limitations on the size of airships the Germans might build as effectively to stifle the construction of any airship of ocean-going size and ability even though the state of the art would have permitted such in 1919.

But for American insistence the airship project might have been snuffed out entirely. Two wartime Zeppelins to which the United States was entitled, were destroyed before delivery by the German crews in their hangars. After lengthy negotiations, the Allies agreed to allow Germany to build for the United States as a replacement one airship of ocean-going characteristics and restricted to non-military duty. Designated LZ-126 and by the United States as the ZR-3, the resulting ship arrived at Lakehurst and was turned over to the U. S. Navy on October 15, 1931. Shortly thereafter, the wife of the President, Mrs. Grace Coolidge, christened the ship "LOS ANGELES". Now in her 15th year, this splendid ship is still in good condition and although restricted by order to experimental uses on the ground, is still capable of further valuable service. For years the LOS ANGELES served as a "full-scale" model and laboratory for many experimental projects both in the air and on the ground. Practically all of our American airship personnel at one time or another

THE HINDENBURG

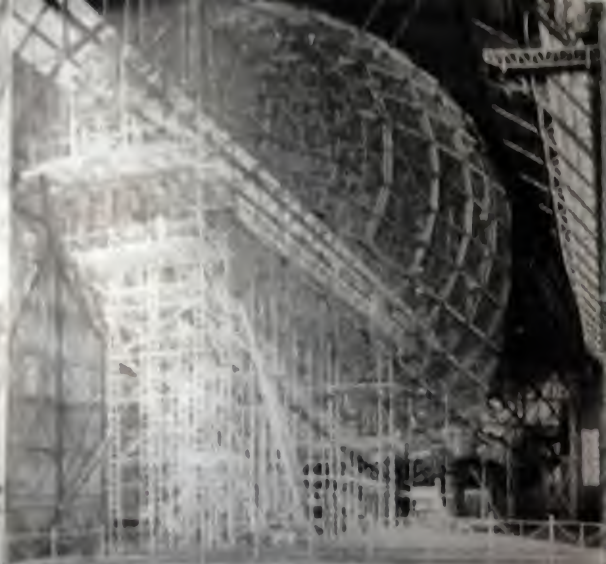
LATEST OF AN ILLUSTRIOUS LINE

underwent training on this splendid school ship. And now the LOS ANGELES a bit older but still spry is still on hand to greet the HINDENBURG, latest of its family.

When finally the allied restriction on size of German airships was lifted, there came into being the LZ-127 now illustriously known throughout the entire world as the GRAF ZEPPELIN and probably the most successful aircraft ever built. Volume being an important factor in airship design and performance, the Germans made the GRAF ZEPPELIN of the largest bulk that could possibly be built in the one suitable airship hangar at Friedrichshafen that had not been destroyed by Allied order. Although possibly not of the best aerodynamic design because of the restricted circumstances under which she was built, the GRAF ZEPPELIN has nevertheless had a most remarkable record. First airship designed, built and operated for ocean-going transport, equipped for 25 passengers plus considerable mail and freight, the GRAF ZEPPELIN has shown unmistakably the practicability and advantages of such transportation. Completed in the fall of 1928 the GRAF ZEPPELIN first visited the United States after a thrilling voyage across the North Atlantic during which the fabric of her port horizontal fin was damaged. Nevertheless by skilful handling by experienced personnel, the ship reached her destination with entire safety with a full load of passengers, mail and other cargo. A year later this famous ship completed her historic and unexcelled round-the-world flight of nearly 22,000 miles with 20 passengers, mail and other cargo in slightly more than 20 days. Since that time the GRAF ZEPPELIN has engaged in regular scheduled transport between Germany and South America. In her slightly more than 6 years' operations up to the end of 1935, the GRAF ZEPPELIN had carried 847,420 miles in 13,358 hours on 595 flights; had carried 32,962 persons of which 11,929 were passengers, plus 78,600 lbs. of mail and 111,500 lbs. of freight; had made 111 ocean crossings, including more than 50 round trips to South America.

This remarkable performance of the GRAF ZEPPELIN has been done consistently on schedule at least as faithfully as any steamer and with a perfect record for passenger safety. As a matter of fact, it is not generally realized that commercial lighter-than-air craft have carried a quarter of a million passengers without as much





as a search to a single one. It is the only form of commercial transport having a PERFECT record for safety.

It is planned to use helium as the inflation medium of this ship when it becomes available to operations inside the United States. Consequently the Germans have planned a set of gas cells for the HINDENBURG which include smaller interior cells to contain hydrogen which may be used finally to reduce the buoyancy if operating factors require it. Completely surrounded by helium this use of hydrogen should be entirely safe. The buoyant gas from which the ship obtains its lifting capacity is contained in 18 individual gas cells placed end to end having a total volume of 7,000,000 cu. ft. The gas cell material is a specially developed cotton cloth impregnated with a gas-tight sealing material.

The HINDENBURG is the first airship to be powered by oil burning diesel engines. It has four such motors of 1100 rated horse power each, built by the Daimler-Benz Works in Stuttgart, Germany. Each motor is installed in its own gondola or power car suspended from the ship's body by wires and positioned by struts. Each car contains all the equipment necessary for the operation of the motor and is large enough to permit full observation of the motor as well as to make certain repairs. Access to the power cars from the body of the ship is had by means of ladders which when not in use fold up in the shape of a streamlined strut. Engineers in the 4 power cars handle the engines in accordance with orders transmitted to them by means of a mechanical telegraph system similar to that used on steamships. Orders to the engines are rung up on an indicator in the control car and through a system of cables moving a pointer, the orders are indicated on a circular dial in each power car, and similarly repeated back.

The total 4,400 horsepower gives the ship a maximum speed of 84.2 miles per hour and a cruising speed of 78.1 miles per hour. With a maximum fuel capacity of 113,650 lbs. the ship has a range at cruising speed, neglecting wind, of 87.50 statute miles. The use of fuel oil in the engines of the HINDENBURG gives the ship a safety advantage over other craft using highly volatile gasoline. The fuel supply is distributed in tanks suspended on the sides

of the lower keel and easily accessible, all tanks being connected to a distribution manifold and a common fuel main extending throughout the ship.

Each engine drives a 14-bladed wooden propeller about 19 ft. 9 in. in diameter. Remarkable backing power is afforded the ship by reversing the direction of the propellers through reversing the rotation of the engines themselves. The HINDENBURG's propellers are not, however, "reversible" in the usual sense as was the case in the AKRON and the MACON.

The bridge or control car from which the ship is operated is located forward outside the main hull in a small streamlined "blister".

In the forward end of the control car are located the two steering wheels, one for operating the rudders and the other for the elevators. Instrument panels and controls are mounted in the same compartment for manually operating the maneuvering valves in the gas cells individually or altogether. A ballast control panel permits the dropping of ballast from various locations about the ship by operation of the toggles on the board. In about the middle of the control car is found the navigator's chart room where the plotting and determining of the ship's position are carried on. In the after end of the car are located navigational instruments for making drift and other observations.

The rudders and elevators at the stern of the ship are operated by hand from the control car through a system of gears and cables moved by the steering wheels. Electrical power is also provided for operating the rudders and elevators by a sort of motorman's control handle. This electric control may be disengaged instantly if it is desired to resume hand control. An automatic gyro control device similar to that found on surface vessels permits automatic directional steering of the ship. These methods of steering control have demonstrated their practicability in the scores of thousands of miles flown by the GRAF ZEPPELIN.

The HINDENBURG was given the honor of inaugurating the 1936 schedule to South America, while the GRAF ZEPPELIN has resumed its methodical operations in the same service. Frankfurt, Germany, is the operating base in Europe with Rio de Janeiro the Brazilian terminal. Stops are sometimes made at Seville, Spain and at Pernambuco, Brazil. Interspersed with trips to North America during the summer and early fall of 1936 are several other voyages of the HINDENBURG between Germany and Rio de Janeiro.

Like most of its predecessors, the HINDENBURG was built at the works of the Luftschiffbau Zeppelin at Friedrichshafen, Germany. Her length is 804 feet or 129 feet more than that of the largest battleship; her overall height is 116 feet or the equivalent of a 12 story building. The total volume of this great ship is a little over 7,500,000 cu. ft.

The hull of the ship is a streamlined body having a "fineness ratio" of about 6 to 1 meaning its length is 6 times its maximum diameter. It incorporates the typical zeppelin construction of braced main rings, auxiliary rings between the main rings, and 36 longitudinal members. The metal used in the framework is a very strong, light aluminum alloy already thoroughly tested in the GRAF ZEPPELIN. The main frames or rings are of the flat wire braced type using strong steel wires for bracing. The outer cover stretched taut about the metallic hull is a strong cotton fabric weatherproofed by "doping". In places where greater strength is required linen cloth is used. The inside of the upper portion of the outer cover is colored red against the effect of ultra violet rays.

Two main corridors provide accessibility throughout the ship, one running along the very bottom and serving

as the main load carrying unit containing along its length fuel and water tanks, staterooms, freight compartments, crew quarters, etc. The second corridor runs through the very center of the ship, fore and aft, tying the bow and stern together. While the lower or main corridor handles traffic through the ship, the center or axial corridor, besides being a primary strength member also permits inspection of gas cells and their valves.

Immediately above the control car within the hull of the ship is found the radio room containing equipment for wireless telephone and both long and short wave radio communications. Radio direction finding equipment is also provided. Interior communication throughout the ship is provided by an automatic telephone system having 24 stations at vital parts of the ship all connected up through a common switchboard.

Staterooms for the captain and some of the officers and the mail room also are found above the control car for ready accessibility.

Two 50-horsepower diesel driven generators together with necessary switchboards and similar equipment located in the lower keel about midships, comprise the independent electrical power plant for radio, lighting,



heating, cooking and other uses.

The ship is equipped to land either on the ground at the hands of a ground crew or to make what is termed a "flying moor" to a mooring mast. Instead of the conventional bumper bags the HINDENBURG has two large landing wheels, one under the control car, the other under the lower fin. These wheels are equipped with large pneumatic tires and are so mounted on casters or turntables that they may swing readily in any direction. The wheels are retractable so as to decrease drag in flight.

Accommodations for a deck force of 22 in the crew are located just aft of the passenger space. The engineer's force has its quarters containing 12 bunks, in the lower keel in the after part of the ship near the vicinity of the power plants. While no weight has been wasted on unnecessary luxuries, the quarters for the crew are indeed comfortably sufficient.

Far more luxurious than those found on any other aircraft are the passenger accommodations on board the HINDENBURG. Passengers go on board by means of two hinged gangways lowered from the passenger space, which are located slightly abaft the control car on two



decks known as A deck and B deck. The lower or B deck contains the smoking room which is an innovation in commercial airships. This room is very cleverly designed and executed. To reach the smoking room one must pass the bar and go through a door which can be opened only from the outside. When one desires to leave the smoking room the door must be opened by the steward by means of an electrical contact after the steward has assured himself that no lighted cigar or cigarette is being carried out. Tricky ash receivers distributed about on attractive aluminum tables in the smoking room automatically close air-tight and smother glowing cigar or cigarette stumps. Outboard of the smoking room as well as outboard of the entire B deck are provided slanting windows which permit an unobstructed view of the ground. The walls of the smoking room are covered with washable leather and decorated with pictures of airship travel. In historic sequence they illustrate the fantastic attempt of the Jesuit Father, Francesco Lanaia in 1670, the first balloon ascent of the Montgolfier brothers and views of modern airships.

Installed next to the lavatories on the B deck are found the baths containing both hot and cold showers, an innovation never before tried on any aircraft. On the same B deck is located the electrical kitchen or galley which provides food for both passengers and crew. Several refrigerators, a four-burner electrical range and a three-compartment warming cabinet are located therein. The pantry adjacent to the kitchen is equipped with closets with many compartments for the tableware and is connected to the dining room by a dumb waiter as well as a staircase. Ventilation through a specially constructed air shaft insures freedom from cooking odors. Miscellaneous rooms for the crew and the officers are also located on the B deck.

A large decorated stairway leads between the A deck and the B deck. On the A deck are the 25 passenger cabins each of ample size and comparable to those on steamers, and much more commodious than heretofore associated with any form of air travel. Each cabin contains two berths, the upper one of which can be raised and hidden during the day while the lower one is converted into a comfortable sofa or lounge. Each cabin also contains a desk, a clothes closet and a wash basin with hot and cold water connections which may be concealed when not in use. Surrounding the A deck passenger spaces outboard on each side is a promenade 50 feet long, provided with slanting windows which afford an opportunity to appreciate the scenery over which the ship speeds. Window seats and comfortable benches are so located that passengers may sit and view the passing panorama.

On the port side of the A deck just inboard of the promenade is the spacious dining room 46 x 16 feet in size. The corresponding space on the starboard side is allotted to a salon and a reading and writing room. These spaces are separated from the promenade by a railing low enough to permit vision through the outboard windows.

The dining room is decorated with paintings whose motif is the vivid impression in chronological sequence that one receives on an aerial journey from Germany to Brazil. First, one sees the Zeppelin Works, Friedrichshafen and Lake Constance, then landscapes of Spain, Africa and South America. Each painting truly represents the flora and fauna of the country which it depicts. The salon is decorated with paintings depicting historical ocean crossings from the first primitive ships of daring explorers to the latest less thrilling but equally awe inspiring means of travel. Interior decorations throughout were executed under the direction of Professor Fritz August Brenhaus of Berlin while the paintings are the work of Professor Arpke.

In the construction of furniture, weight saving was

of course a major consideration. Consequently it is made of duralumin reinforced by packing and material wherever not needed for strength. With such these restrictions it is apparent that the designers were able to create not only light and entirely useful furniture but beautiful articles as well.

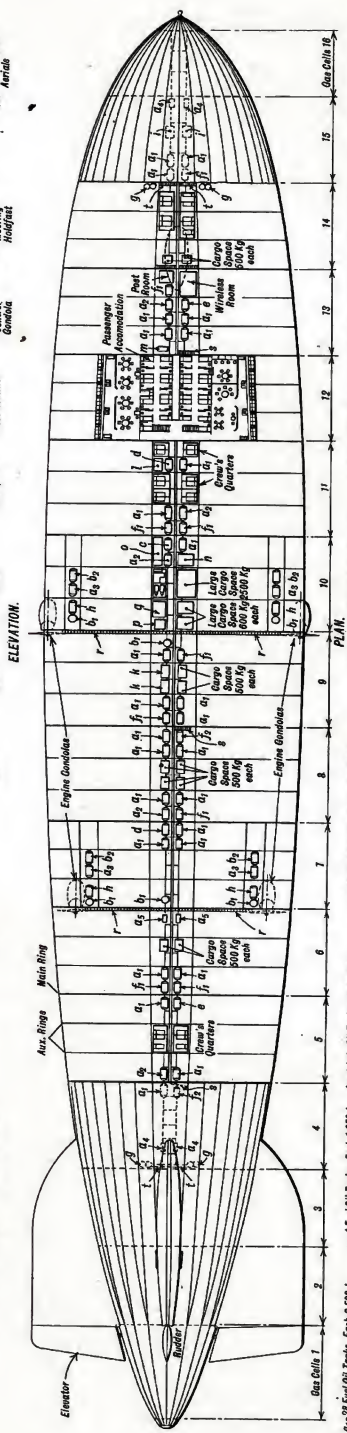
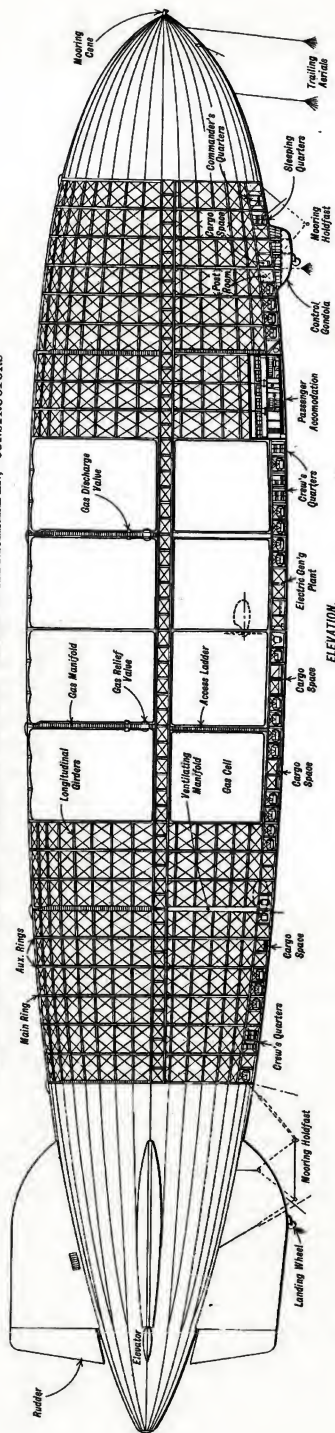
Passenger spaces are amply ventilated and heated.

Considering the time fact that even in the roughness of the ocean an airship equipped with other modes of transport is gentle, the shore conductors did to insure the smoothest and most comfortable ocean voyages one can find anywhere. Immediately upon the completion of the HINDENBURG, the LZ-130 began to take shape. The combined operations of the GRAF ZEPPELIN and the HINDENBURG, providing the smoothest and most comfortable type of travel over oceans should indeed make the world "airship conscious" and hasten the day when we shall see fleets of monster and even larger and faster craft streaking through the heavens in lanes white and swift on definite schedules all over the globe.

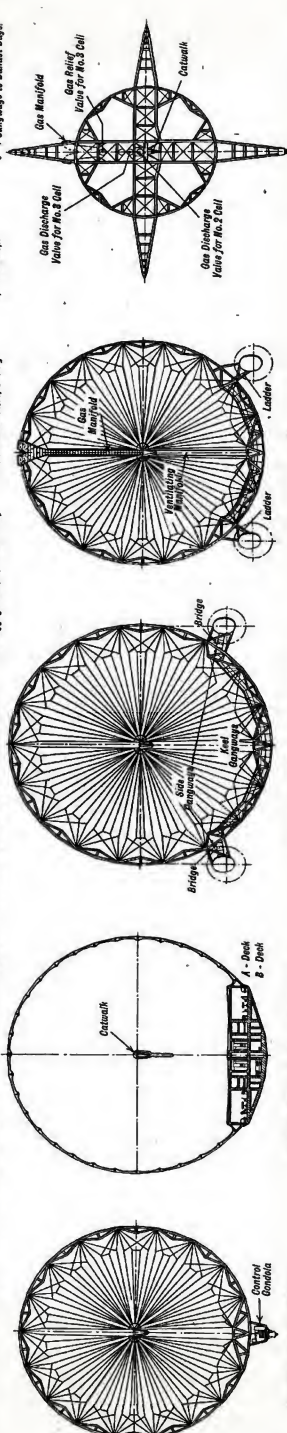


THE ZEPPELIN AIRSHIP "HINDENBURG"

DR. H. ECKNER, DESIGNER: LUFTSCHIFF ZEPPELIN G.M.B.H. FRIEDRICHSHAFEN, CONSTRUCTORS



a₁-20 Fuel Oil Tanks, Each 2,500 L. a₂-4 Fuel Oil Tanks, Each 1,850 L. b₁-6 Lub. Oil Tanks, Each 850 L.
 a₃-4 Fuel Oil Tanks, Each 2,500 L. a₄-2 Fuel Oil Tanks, Each 850 L. c₁-1 Drinking Water Tank, 2500 L.
 a₅-4 Fuel Oil Tanks, Each 800 L. b₂-1 Lub. Oil Tank, Each 500 L. c₂-2 Fresh Water Tanks, Each 2,500 L. f₁-2 Tanks for Recovered Ballast Water, Each 2,000 L.
 g-4 Double Ballast Bags, 2 x 500 L. h-4 Cooling Water Tanks, Each 400 L. i-1 Provision Store, 500 Kg.
 j-2 Language Comp^s, Each 500 Kg. m-1 Provision Store, 250 Kg.
 n-Engineer's Room. Ventilating Fan. o-Ventilating Fan. p-Workshop.
 q-Engineer's Room. Ventilating Fan. r-Gangways to Engines. s-Gangways to Access Ladders. t-4 Gangways to Ballast Bags.



SECTION AT CONTROL GONDOLA.
 SECTION AT NEAR ENGINE GONDOLAS.
 SECTION AT FORWARD ENGINE GONDOLAS.
 SECTION AT RUDDER FINS.



Left, REAR - ADMIRAL W. C. WATTS, N.S.N., Commandant of the Fourth Naval District in which the Lakehurst Naval Air Station is located.



Right, DR. HUGO ECKENER, Commodore of the Zeppelin fleet and Director of the Luftschiffbau Zeppelin at Friedrichshafen, Germany. Dr. Eckener is not only a scientist but the world's most experienced airship operator as well.



Left, COMMANDER CHARLES E. ROSENDAHL, U.S.N., prominent Naval lighter-than-air expert, former commander of the U. S. Dirigible Los Angeles, first commander U. S. S. Akron and at present commanding officer of the U. S. Naval Air Station, Lakehurst.



Right, CAPTAIN ERNST A. LEHMANN, Captain of the Hindenburg, the man actively at the wheel, former commander of war-time Zeppelins.

THE AIRSHIP OUTLOOK IN THE UNITED STATES



TODAY the future of the American lighter-than-air ship hangs in the balance. It depends largely on a change from an apathetic attitude towards the airship and on realization of the fact that the principle of specialization holds good in aerial transportation just as in every other form of transport.

Uncertainty as to the future of the airship is not legitimately based on any doubt of its practicability or utility; there are abundant facts which properly interpreted, point to advantages of the airship entirely sufficient to warrant continuation of its development. The uncertainty lies only in whether the American people will realize the advantages of the airship and whether they will then follow up with a fair and adequate program for justly arriving at a definite decision as to whether the advantages of the airship are sufficient to warrant a permanent place.

Of all pioneering development in transportation, the airship is undoubtedly the least understood. Unfortunately it has been judged largely by "hearsay" evidence. Few persons have taken the trouble to look behind the scenes and to weigh the basic facts and factors against the purely "news" features. Yet, every fair minded group which has investigated the airship fully enough has found much in its favor. A great mass of detailed information has been developed which, properly digested and disseminated, would do much towards changing public attitude towards the airship. Unfortunately, however, such material has been largely smothered under the wider "human interest" appeal of flatter current events. Unfortunately also is the fact that those who really know something about airships

are few in number, and they are so restricted by other practical considerations that the airship has not yet had the benefit of such continuous widespread ballyhoo and propaganda as have steamships, railroads, automobiles and airplanes.

To understand the U. S. Navy's interest and obligation in regard to rigid airships, it should be remembered that there exists an agreement of long standing with the Army whereby the Navy is charged with the development of rigid airships in the United States. To carry this out, the current Naval Policy contains this phrase:

"To build and operate rigid airships as necessary to determine their usefulness for naval and other governmental purposes and their commercial value."

Certainly it cannot be said that this policy has been carried out to fair completion. We have not yet determined the usefulness of the rigid airship for "naval and other governmental purposes" nor "their commercial value." Our efforts have been inadequate for such an important project. But, although the Navy holds the responsibility for the development of such a carrier for commercial as well as naval and other governmental uses, it must be governed in turn to some degree by what the people of the country through their representatives determine as the measure of adequacy and thoroughness for arriving at the answers.

There must be more general recognition of the fact that just as in every other form of transportation, there are in the field of aeronautics, room and need for specialization—special types of aircraft to do special kinds of duties in the aerial oceans. In the Navy we have an age-old saying, "A place for everything and everything in its place." The aeronautical version might well be, "A place for each type of aircraft and each type in its own place."

Specialization in all walks of life was probably never more widely accepted than today. In overland transport for example, we find extra-fare, express, slow freight trains; passenger and freight buses; electric lines; airplanes of many kinds—landplanes, seaplanes, flying boats, amphibians. At sea, a few "express" steamers of about 30 knots fair-weather speed have been added to the already existing assortment of passenger steamers offering various

degrees of accommodations and speed, and of tankers, freighters, and even wind-jammers; yet these new vast floating palaces have not driven the other types off the surface of the sea.

In a Navy the battleship, though powerful and sturdy, is not suited to perform by itself the many specialized duties required for a Navy; hence it has a wide assortment of team-mates. No one has yet suggested that the amphibious tank, for example, capable of propelling itself over land and through streams of water, will replace all weapons of the armed land forces. It would indeed be Utopian for both taxpayers and the armed services could armies and navies each find one single universal weapon instead of requiring such an actual wide assortment of "tools," each serving best at some particular time and place but none of universal application.

And so in aerial transport there is yet no universal type and consequently there is room and need for both heavier-than-aircraft carrying light loads for short or moderate distances at very high speed, and lighter-than-aircraft carrying much greater distances and much more comfortably and safely, at speeds not so high as the airplane's but much greater than those of which surface vessels are capable. In a Navy such as our own, there are jobs to be done which can best utilize the long-range airship scout and the smaller non-rigid airship for anti-mine and anti-submarine operations, convoying and such duties as require an elevated platform and wide speed variation from zero up to much more than that of which surface vessels are capable.

To judge the future of the airship, one must first glance briefly at its past.

Even before, but particularly in the years following Colonel Lindbergh's famous North Atlantic solo in 1927, the world has heard many promises of practicable and economical oceanic heavier-than-air craft "within a few years." But there has not yet been demonstrated in satisfactory scheduled commercial operation any heavier-than-air craft capable of spanning the usually travelled oceanic routes on an economical basis.

On the other hand, the world's first regular trans-oceanic mail, passenger and cargo service by air began at the moment there was put into service the very first rigid airship built for such a purpose. Completed in 1928, the GRAF ZEPPELIN made numerous outstanding miscellaneous flights a few years and then settled down to scheduled service between Europe and South America. But for man's own artificial barriers, there might have been comparable oceanic airship service over the whole globe several years ago. It might well have begun in 1919. Following the World War, there were imposed upon Germany the laboratory and "proving grounds" of the rigid airship such unfortunate restrictions as to size of airships she might build as definitely to preclude airships of oceanic capabilities otherwise entirely feasible even at that time.

The vital factor in the transportation of payloads by air is the TOTAL ELAPSED TIME whether the journey be broken or continuous. On the first attempt over the Pacific, even YESTERDAY'S airship represented by the 1928 model GRAF ZEPPELIN, more than 6 years ago carried 39 persons, 20 of them passengers, and 1,000 lb of mail and other cargo, comfortably and safely, nonstop by day and by night, in fair weather and foul, from Tokyo to San Francisco in 69 hours, or less than 3 days! It is of more than passing interest to note that during the last part of the journey from Germany to Japan but a few days before, Dr. Eckener with concern learned of a typhoon tearing northeasterly across the Sea of Japan. His concern, however, was not that of giving it a wide berth; quite the contrary, he sought out and utilized the northerly winds along its rear to nearly double the GRAF ZEPPELIN'S

normal speed over the ground. Departing from Japan, the GRAF ZEPPELIN again chased and overtook a typhoon to gain the advantage of the westerly winds along its southern border.

TODAY'S airship, represented by the HINDENBURG, could carry 50 passengers plus 20 tons of other cargo from either Canton or Manila to San Francisco in 3½ to 4 days! Naturally every American thrills and applauds the present adventurous air pioneering of the Pacific under the American flag. Yet if we can afford to establish a transpacific air service to transport about one ton of pay cargo between the required points in 5 to 6 days' time, we cannot afford to overlook a carrier unequalled in safety and comfort, that can carry 50 passengers and 20 tons of other pay cargo between the same points in the shorter elapsed time of less than 4 days.

Turning now to the Atlantic and glancing again at the proven performance of YESTERDAY'S airship, one finds that the GRAF ZEPPELIN more than 6 years ago comfortably and safely spanned the North Atlantic nonstop, by day and by night, from the Statue of Liberty to the Scilly Islands off the tip of England with 63 persons, 23 of whom were passengers, and 1,800 lbs. other cargo, in 30½ hours. New York to Paris was negotiated in less than 48 hours; Friedrichshafen in Central Europe required only 7 hours more to reach. TODAY'S airship with very materially greater payload can span this route in even less time.

As to the element of SPEED, the primary and preponderant reason for any form of air transport, the airship plugging along day and night nonstop, with no necessity for intermediate stops on even the longest of ocean stretches, on a "great-circle" rather than a zigzag course, free to choose its path with regard to meteorological science and conditions because of its abundant cruising radius, even at its lower hourly speed than that of heavier-than-aircraft which, however, does not have to be averaged with the zero speed of many hours at rest for frequent refueling and at night, with its exceedingly greater pay cargo, actually arrives at its destination in appreciably less ELAPSED time than does the short-ranged airplane. The airship is the bulk and quantity aerial carrier over oceans. It appears entirely probable that it will also prove to be the most ECONOMICAL of oceanic air carriers.

(Continued on page 22)

The weather station at Lakehurst, important assistant to the airship.





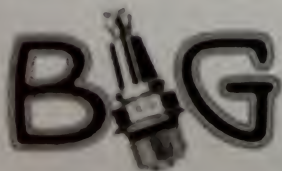
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Elementary Features

(Continued from page 11)

remain aloft as a balloon. If the airship wishes to hover over any spot, it simply heads into the wind and slows down its engines until its own speed is the same as that of the wind. It is not generally realized that in flight there is no load imposed on the ship by "wind" but only by its own power. "Wind" affects only the ship's speed over the ground. For example any aircraft, large or small, that can make 60 miles per hour from its own power in still air, when heading into a 20 mile wind, makes only 40 miles per hour over the ground. If the wind is on its tail, it would make 80 miles per hour over the ground regardless of its size or type. The effect of winds at an angle to the ship's course can be readily computed. The load on the ship's structure is the same in either of the cases cited, since it is due only to its own 60-mile "airspeed." When held on the ground against the wind as when moored to a mast, however, of course the total pressure or load on the aircraft does depend on its size and the strength of the wind.

Until the mooring mast was perfected, an airship landed by dropping lines to a ground crew which by man-power alone pulled the ship to the ground against its buoyancy. The smaller non-rigid airships are equipped with a landing wheel so that they may fly directly to the ground where men grab the dangling lines and hold the ship on the ground while being refueled and reserviced. However, mooring masts for non-rigids also are now coming into general use. The modern practice of landing a rigid airship is to approach the mast from leeward, and drop the ends of three wires secured to its nose. The main wire is coupled to a similar wire on the ground which leads through the top of the mast to a winch at the base that reels in the wire and pulls the mooring cone on the ship's nose into the corresponding cup on top of the mast. The other two lines from the ship are coupled to similar ground wires and lead out to the sides and slightly aft to keep the ship headed into the wind and towards the mast and to prevent it from over-riding the mast structure.

The original mooring mast was a high structure at which the ship rode above the ground at a considerable distance with its stern free to move vertically as well as laterally. The latest mooring mast is the stub or low mast where the ship rides but a few feet above the surface. Its stern is secured to a heavily weighted car which moves on a circular railroad track about the mast so that the ship may answer fluctuations in wind direction readily but cannot move vertically.

Before the mooring mast became so successful, airships between flights here put into hangars. Because of the great wind pressure that could be exerted on a large airship when held against the wind, the housing and unhousing operation was a delicate one. When man-power alone was used for this operation, not only were many men required but the operation was a tricky one. The U. S. Navy has developed mechanical equipment for handling airships in and out of hangars, whereby there are required only scores of men where previously hundreds were needed. The principle item in this mechanical handling gear is the mobile mooring mast which travels on rails and under its own power tows the ship in or out of the hangar. The stern of the ship is handled by means of a "stern beam" whereby lines from the side of the ship are led to the ends of the beam to hold the ship parallel to the hangar against the wind. In modern airship operation, the hangar is the "dry dock" to which the airship resorts for extended repair or overhaul; the mooring mast is the airship "harbor" or anchorage from which it normally operates and where it may reservice for the next flight.



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Left: Aircraft Right: Airship

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For, this year, Germany draws the spotlight of world interest and plays the leading role in the itinerary of transatlantic travelers. A host of attractions will crowd across the vacation stage.

XIth OLYMPIC GAMES—in Berlin, August 1-16—glorious sports spectacle with 50 nations competing for the sports supremacy of the world. International Olympic Art Exhibitions. The Olympic Regatta at Kiel.

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And in addition, Germany's eternal attractions. Superb scenic grandeur . . . the romantic Rhine, Black Forest and Bavarian Alps. Ancient castles, famous in song and story, medieval walled towns and quaint customs. Museums, galleries and cathedrals. Progressive modern cities. Famous German health resorts for rest and new health. There is no need to pick and choose—just go to Germany and enjoy yourself. It can be done on a modest budget because railroad fares are reduced 60% and Travel Marks help to fill the dollar's foreign exchange value. Write for booklet 2.



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theatre.

Famous Neuschwanstein castle in the Bavarian Alps will delight its visitors with a series of Richard Wagner concerts in July and August.

Baden-Baden has its great festival weeks of international races, balls, concerts, theatre and opera, fireworks and other events from August 23rd to 30th and provides concerts of the Berlin Philharmonic, a fashion show and a dance tournament in May and a chain of movie and theatre events and social activities throughout the summer.

A festival week of young poets and composers will attract to Braunschweig (Brunswick) during the week from June 21st to 27th.

And then there are these world famous picturesque folk and history plays in almost every one of Germany's untold medieval towns, in which the entire population, dressed in costumes of centuries ago, are the actors and the whole towns the inimitable stage settings. And there are everywhere, the spontaneous "Feste", for which the natives in colorful dress gather to celebrate in the customs of their ancestors of centuries ago. The "Meistertrunk" of Rothenburg, in which this most perfect gem in Europe's diadem of medieval cities reenacts the great events of its history in the Thirty Years War; Dinkelsbühl with its famous "Kinderzeche"; Landshut with its "princely Wedding of 1475"; the fascinating history play of Marienburg in East Prussia; "Schuetzenfeste" market fairs and costume festivals.

Later in the year, harvesting and vintners' festivals add color and thrills to travelers in Germany.

Impressive are the festivals of the New Germany, the honor days of the city worker and the peasant, foremost among them the "Bauerntag" (Peasants' Day) on the Bueckeberg, the "Erntedankfest" (National Thanksgiving), on the Bueckeberg, near historic Hamelin, the day of German work and the now internationally famous National Socialist Party Convention in Nuremberg.

More numerous than usual, due to the great influx of visitors from all countries to the Olympic Games, will be the international congresses, meetings, fairs and exhibitions in Germany this year.

In Berlin, the International Municipal Congress will be attended from June 7th to 13th, by 1500 city officials from 25 countries. Meetings of this congress will also be held in Munich.

Immediately after the Olympic Games, from August 17th to 22nd, the International Congress of Throat, Nose and Ear Specialists will be held.

The International Sports Physicians Congress will be held in the German capital July 27th to 31st immediately before the Olympic Games.

The "Great German Radio Exposition 1936" is also in Berlin, August 28th to September 6th. An International Congress of Film Amateurs is held in Berlin July 24th to 30th, a national exposition "Germany" from July 18th to August 16th and an international congress of the "Society for Voice Hygiene" from August 20th to 22nd.

Other important international gatherings are the World Economic Society Congress in Dusseldorf May 21st to 25th and, in the same city, the International Iron



Exposition Congress September 16th to October 7th, and an exposition "Film and Photo" May 16th to July 1st.

The National Agricultural Exposition is held May 17th to 14th in Kassel, when after a show of German work will be held in June.

Hamburg has an international congress "Radio Science, Music and Entertainment" from July 23rd to 27th. Heidelberg an international congress from June 19th to 26th, Leipzig and an exposition "Central Germany" beginning in October.

The National German Garden Show which is usually attended by many visitors from foreign countries began in Dresden on April 24th and lasts to October 11th.

The German Flower Show will be held in the recreation grounds of the Radio Tower in Berlin during the summer months.

An exposition "German Advertising", this year from August 28th to September 13th in Dresden, is always visited by the advertising experts from many parts of the world, particularly since the World Advertising Congress was held in Berlin a few years ago.

"The Life" is a recurrent exposition that has attracted much international attention and will be held this year from May 9th to June 1st. A large number of poets, writers from the United States and Canada will attend the 2nd, in connection with which a great Poetry Show will be held in one of the large exposition halls on the Leipzig famous Leipzig Library.

While the "World's Interest" is concentrated on the Olympic Games in Berlin and Kiel, many other important international sport events will have their usual attraction for foreign visitors.

The German Derby will be run in Hamburg, June 28th.

International Horse Races at Hagenhausen and Karlshorst, the race tracks of Berlin, are held from July to November. Berlin has also the A. World Bowling Tournament, in connection with the 25th anniversary of the German Bowling Association and world and German Championships.

In Aachen (Aix-la-Chapelle) the XII. International Riding, Driving and Jumping Tournament will be held June 1st to 10th.

Baden-Baden has its International Horse Races, with the International Grand Prix of Baden, late in August.

There are golf and tennis tournaments, automobile, motorcycle and horse races, water sports events and aviation meets and contests throughout the summer in all parts of Germany, particularly in the great cities and the many famous health resorts.

A demonstration of glider flying, in which several countries will take part in Berlin during the period of the Olympic Games, will attract intense interest.

And Germany is making it easy to enjoy what she has to offer. A 50% railroad fare reduction for those remaining in the country seven full days, and travel marks for tourist requirements within the country, make a visit to Germany an inexpensive delight.

Airship Outlook in the United States

(Continued from page 15)

One committee leaves the old argument of why not build planes for the cost of one airship. First, we couldn't get away from the latest big plane for that price. But, however, the structure has a constant aerodynamical effect.

Nothing in aerodynamics has anywhere else do we get something so definite. It is fallacious to compare the cost of an airship with that of a plane, they are different types of craft, built for different purposes. A naval airship is an aerial ocean vessel, in comparison the rigid airship performs in the oceanic long-range field. The individual characteristics of its type of ship or plane are changed simply because it must be built to operate in both or groups.

Each of the suggested planes is still capable of its present single duty as it would be by itself. The group as a whole could go no further than one cost in it. One might as well suggest building a number of yachts or motor vessels for the price of one ocean-going vessel; a number of destroyers instead of one cruiser; or a number of small airplanes instead of one large flying boat. A very effective case for oceanic movement can be worked up for the airship as compared logically with a surface vessel cleared to sailing. If we want the advantages of the airship we must pay airship prices, and there will be found to be reasonable when we consider the duties to be performed.

As to the naval employment of rigid airships one hears much pro and con. In the World War, contrary to common belief, bombing raids particularly over England by German Zeppelins constituted only about 30% of their employment. The other 70% of the work was at sea in conjunction with the Navy. In both German and British references, ample support may be found for the effectiveness of naval airships.

In the United States we have built only three rigid airships. The SHENANDOAH was a copy of a 1916 type Zeppelin that fell in France; it was our initial effort and is best represented but a stepping stone to modern ships. At that, it was at least as much of a success as our first submarine, first airplane or our other first. The AKRON and the MACKINAC finished more than 8 years after the SHENANDOAH, represented somewhat radical departures in design and size. Had there been nothing more at all, American airships have contributed to the general airship art immeasurably by their translation into service reality of the use of helium, the incorporation of modern mooring and mechanical handling equipment, the development of gyroscopic apparatus, the handling and recovery of airplanes in flight, and so on. These were all costly lessons in life and added weight compared with hydrogen-inflated manually handled ships. But nevertheless our ships represented other progress also.

Because of the need for developing the ships themselves and their basic auxiliary features, our airships have so far had but small opportunity to develop their naval tactics and applications. Yet even in the exercises in which they have participated, they have demonstrated a worthwhile naval utility of a nature which today's airships alone are capable of developing.

Certainly the future holds much greater development in every feature of the airship if we but apply the effort. Today, by virtue of more than a quarter century's persistent, intelligent and continuous effort, Germany enjoys pre-eminence in the commercial airship field. America with its abundant wealth and monopoly of the absolutely safe helium

gas for inflating airships, its natural resources and engineering ability, can well be mentioned with one future to take a most prominent place in the oceanic airship field.

Following the loss of the MACKINAC, in February, 1933, the Secretary of the Navy requested the President's Science Advisory Board to appoint a suitable committee to review and analyze the past and present situation as to design and construction of airships and to make recommendations as to their future design and construction. To the press, shortly thereafter, the Secretary expressed the thought that the recommendations of this committee would be assigned by the governing authorities as well as Congress. On January 16, 1936, this committee of seven eminent American scientists considered its report after nearly a year's deliberation. Unanimously the committee stated, among other things, in its recommendations:

"In view, therefore, of our expressed opinion as to the practicability of the design, construction and operation of such airships with a reasonable margin of safety and with the presumption of capacity for useful service, it is the unanimous opinion of the committee that the best interests of the service in which airships give promise of useful and effective service, both commercial and naval, require a continuing program of construction and use."

"And in pursuance of this opinion it is our recommendation that the Navy Department should continue with a positive carefully considered program of airship construction."

The language and text of the Committee's report is undoubtedly a signal to go ahead without further delay.

It is sometimes pointed out that certain nations are not developing or operating rigid airships. In this connection it is pointed out that national aspirations, local geographical situations, and international necessities determine such policies. Factors peculiar to one nation may even make a separate air force a primary essential to it, while inapplicable to others. If a nation has no great coast lines and sea domains in whose defense airships might be useful, it can be seen why they might be overlooked. If such a country requires civil aerial instruments for sudden or surprise attacks or defense of homeland borders, the airplane can best fill this need. If a nation has no ambition to enter the field of long range oceanic aerial transport it need not indulge in airships. But such situations are not legitimately entitled to be interpreted as derogatory to the basic value of airships to other countries in different situations.

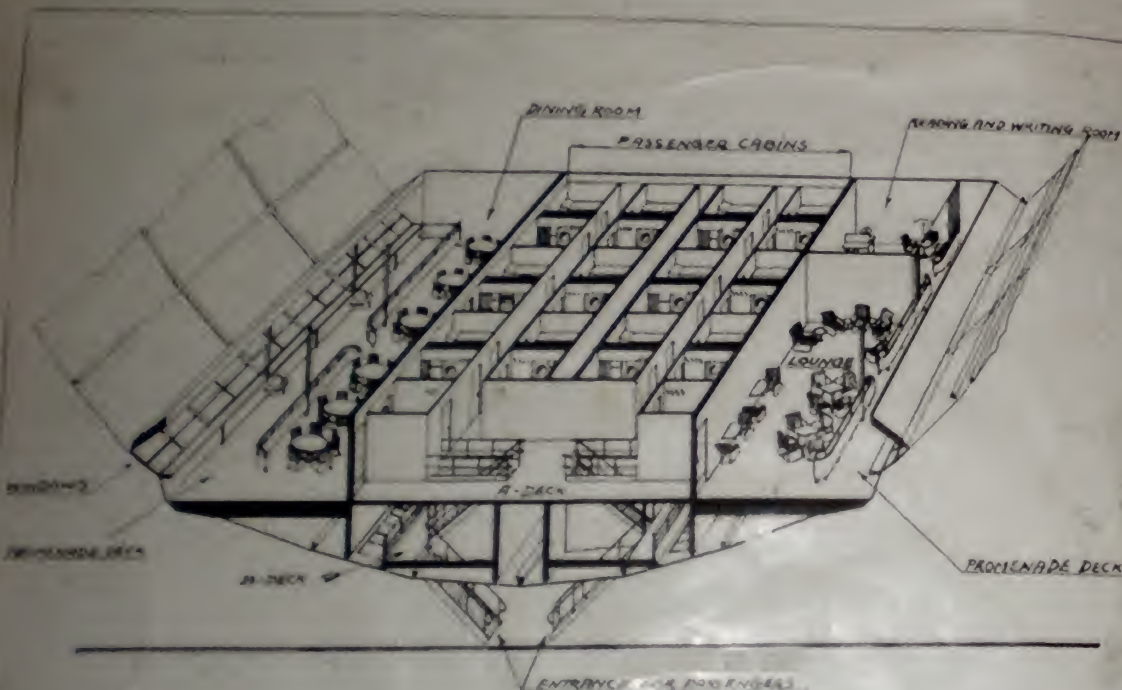
The United States has a special situation from both standpoints. We have enormous lengths of coast line and wide sea areas to be patrolled for the defense of the nation. We have both inclination and necessity for rapid and intimate commercial contact with our over-sea neighbors. Unmistakably rigid airships are essential to the welfare of the United States.

Washed waiting for results by others in the world has certainly never been an American principle or engineering policy. The carelessness of our heavyweights, for example, certainly was not reached by sitting back and letting others fight the pioneering problems before we stepped into the picture. The airships built prior to the war possibilities but it cannot select them in the face of the artificial barriers set up by men themselves through misunderstanding and treaty evidence. Once we arrive at a determined decision to pursue the airship project to a fair and logical conclusion, it is my opinion that American airships will take their place in the world along with other American activities that are now progressively a part of our civilization. Meanwhile the airship awaits this call to serve civilization with those inherent aerial capabilities which are not possessed by other types of aircraft.

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Total lifting gas volume	7,063,000 cu. ft.	Auxiliary Diesel electric generator engines	
Nominal Gas volume	6,710,000 cu. ft.	Top speed in still air	84.375 m.p.h.
Number of gas cells		Travelling speed	78.125 m.p.h.
Weight of ship with necessary equipment and fuel	130,950 lbs.	Range at cruising speed	8,750 miles
Payload in form of passengers	15,470 lbs.	Maximum fuel capacity (Diesel oil)	143,650 lbs.
Payload in form of freight, mail and baggage	26,520 lbs.		
Crew	40 men		



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